

THE UNIVERSITY OF BURDWAN



COURSE MODULES

**FOR THREE-YEAR DEGREE
COURSE IN ZOOLOGY (HONS)
UNDER CHOICE BASED
CREDIT SYSTEM (CBCS)**

SEMESTER I

**(With effect from the session July
2021 - December 2021)**

2. Core Subjects Course Module

2.1. Core T1 –Non-Chordates I

Time: 2 hrs

Full Marks: 50 (40 theory + 10 internal assessment)

Lectures: 50

Questions are to be set covering the entire syllabus; 5 questions (out of eight) of 2 marks each, two questions (out of four) of 5 marks each and two questions (out of four) of 10 marks each are to be answered

Non-Chordates I	4 Credits	Class	TEACHER
Unit 1: Basics of Animal Classification		4	
Definitions: Classification, Systematics and Taxonomy; Taxonomic Hierarchy, Taxonomic types.		1	AR
Codes of Zoological Nomenclature		1	AR
Principle of priority; Synonymy and Homonymy		1	AR
Six kingdom concept of classification (Carl Woese)		1	AR
Unit 2: Protista and Metazoa		15	
Protozoa General characteristics and Classification up to phylum (according to Levine et. al., 1981)		2	MM
Locomotion in <i>Euglena</i>		1	MM
Locomotion in <i>Paramecium</i>		1	MM
Locomotion in <i>Amoeba</i>		1	MM
Conjugation in <i>Paramecium</i>		2	SB
Life cycle and pathogenicity of <i>Plasmodium vivax</i>		2	SB
Life cycle and pathogenicity of <i>Entamoeba histolytica</i>		2	SB
Evolution of symmetry of Metazoa		2	SB
Evolution of segmentation of Metazoa		2	SB
Unit 3: Porifera		6	
General characteristics and Classification up to classes;		2	MM
Canal system in sponges		2	MM
Spicules in sponges		2	MM
Unit 4: Cnidaria		10	
General characteristics and Classification up to classes		2	AR
Metagenesis in <i>Aurelia</i>		2	AR
Metagenesis in <i>Obelia</i>		2	AR
Polymorphism in Cnidaria		2	AR
Corals and coral reef diversity, function & conservation		2	SB
Unit 5: Ctenophora		2	
General characteristics		2	MM
Unit 6: Platyhelminthes		6	
General characteristics and Classification up to classes		2	MM

Life cycle and pathogenicity and control measures of <i>Fasciola hepatica</i>	2	MM
Lifecycle and pathogenicity and control measures of <i>Taenia solium</i>	2	MM
Unit 7: Nematoda	7	
General characteristics and Classification up to classes	1	AR
Life cycle, and pathogenicity and control measures of <i>Ascaris lumbricoides</i>	3	SB
Life cycle, and pathogenicity and control measures of <i>Wuchereria bancrofti</i>	3	SB

2.2. Core P1–Non-ChordatesI Lab

[Questions are to be set covering the entire syllabus; 7 questions each of 2 marks and 4 to be answered;

5 questions each of 6 marks and 3 to be answered; 4 questions of 12 marks and 2 to be answered]

Non- Chordates I		2 credits	
List of Practical	Class	Teacher	
1. Preparation of stained whole mount of <i>Euglena</i> , <i>Amoeba</i> and <i>Paramecium</i>	6	AR	
2. Spot Identification of <i>Amoeba</i> , <i>Euglena</i> , <i>Entamoeba</i> , <i>Opalina</i> , <i>Paramecium</i> , <i>Plasmodium vivax</i> and <i>Plasmodium falciparum</i> (from the prepared slides)	4	SB	
3. Spot Identification of <i>Sycon</i> , Neptune's Cup, <i>Obelia</i> , <i>Physalia</i> , <i>Millepora</i> , <i>Aurelia</i> , <i>Tubipora</i> , <i>Corallium</i> , <i>Alcyonium</i> , <i>Gorgonia</i> , <i>Metridium</i> , <i>Pennatulula</i> , <i>Fungia</i> , <i>Meandrina</i> , <i>Madrepora</i>	6	SB	
3. Spot Identification and significance of adult <i>Fasciola hepatica</i> , <i>Taenia solium</i> and <i>Ascaris lumbricoides</i> .	2	MM	
4. Staining/mounting of any protozoa/helminth from gut of cockroach	5	AR	
Time: 2 Hrs		Full Marks: 20	
Examination Pattern:			
Staining and Mounting-/Whole Mount (Item No.1) -----		=10	
Spot identification (1 from Item 2, 2 from item 3)		(3X2) =06	
Spot identification with significance(1 from item 4)		=02	
Laboratory Note Book -----		=02	
Suggested Readings:			
1. Chatterjee and Chatterjee Practical Zoology			
2. Ghosh, K.C. and Manna, B. (2015): Practical Zoology, New Central Book Agency, Kolkata			
3. Sinha, J.K. , Chatterjee, A.K. and P. Chattopadhyay Advanced Practical Zoology			

Suggested Readings:

1. Anderson, D. T. (Ed.) (2001). Invertebrate Zoology. 2nd Ed. Oxford University Press.
2. Barnes, R.D. & Ruppert, E. E., (1994). Invertebrate Zoology. 6th Ed. Brooks Cole.
3. Barrington, E. J. W. (1981). Invertebrate Structure and function. 2nd Ed. ELBS & Nelson.
4. Blackwelder, R. E., (1967). Taxonomy- A text and reference book. John Wiley & Sons.
5. Brusca, R.C. & Brusca, G. J. (2002). Invertebrates. 4th Ed. Sinauer Associates...
6. Dhama P.S and J.K. Dhama– Invertebrate Zoology– S. Chand and Co.

7. Hickman, C. P. Jr., F.M. Hickuman and L.S.Roberts, 1984. Integrated Principles of Zoology, 7thEdition, Times Merror /Mosby College Publication. St. Louis.1065 pp.
8. Hyman, L. H. (1951). The Invertebrates (Vol-I). Mc. Graw Hill Book Company.
9. Jordan, E.L. & Verma, P.S.(2006). Invertebrate Zoology. S. Chand & Company Ltd. New Delhi.
10. Kapoor, V.C.(2008). Theory and practice of animal taxonomy. 6th Ed. Oxford &IBH Pub
11. Kotpal, R.L., 1988–1992.(All Series) Protozoa, Porifera, Coelentereta, Annelida, Arthropoda, Mollusca, Echinodermata, –Rastogi Publications, Meerut–250 002.
12. Mayr, E. (1969). Principles of Systematic Zoology. Tata McGraw-Hill.
13. Mayr, E. & Ashlock, P. D. (1991). Principles of Systematic Zoology. 2nd Ed., McGraw-Hill.
14. Meglitsch, P. A. & Schram, F. R.(1991). Invertebrate Zoology. Oxford University Press.
15. Parker, T. J. & Haswell, W. (1972). Text Book of Zoology, Volume I. Macmillan Press, London.
16. Pechenik, J. A. (1998). Biology of the Invertebrates, 4th Ed. McGraw Hill..
17. Ruppert E.E., Fox, R.& Barnes R.D.(2003). Invertebrate Zoology: a Functional Evolutionary Approach. 7th Ed. Brooks Cole.
18. Sinha, K.S., Adhikari, S., & Ganguly, B.B. Biology of Animals. Vol. I. New Central Book Agency. Kolkata.

***Classification to be followed from Barnes and Rupert 1994, 6thEdition.**

Core T2–Ecology Course Module

Time: 2 hrs

Full Marks: 50 (40 theory + 10 internal assessment)

Lectures: 50

Questions are to be set covering the entire syllabus; 5 questions (out of eight) of 2 marks each, two questions (out of four) of 5 marks each and two questions (out of four) of 10 marks each are to be answered

Ecology	4 Credits	Class	TEACHER
Unit 1: Introduction to Ecology		4	
History of ecology, Autecology and synecology		1	MM
Levels of organization		1	MM
Laws of limiting factors		1	MM
Study of Physical factors, The Biosphere		1	MM
Unit 2: Population		20	
Unitary and Modular populations Unique and group attributes of population: Demographic factors, dispersal and dispersion.		4	SB
Life tables, fecundity tables, survivorship curves		4	SB
Geometric, exponential and logistic growth, equation and patterns,		2	AR
R and k strategies Population regulation, density dependent and independent factors		4	AR
Population Interactions, Gause's Principle with laboratory and field examples		4	AR
Lotka-Volterra equation for competition.		2	SB
Unit 3: Community		11	
Community characteristics: species diversity, abundance, dominance, richness,		4	SB
Vertical stratification		2	MM
Ecotone and edge effect.		1	MM
Succession with one example		4	MM
Unit 4: Ecosystem		10	
Types of ecosystem with an example in detail		1	SB
Food chain: Detritus and grazing food chains, Food web,		1	SB
Energy flow through the ecosystem: Linear and Y-shaped model		3	SB
Ecological pyramids		1	AR
Ecological efficiencies		1	AR
Nutrient and biogeochemical cycle with an example of Nitrogen cycle		2	MM
Human modified ecosystem		1	MM
Unit 5: Applied Ecology		5	
Wildlife Conservation (in-situ and ex-situ conservation).		3	SB
Management strategies for tiger conservation;		1	SB
Wildlife protection act (1972)		1	MM

Core P2– EcologyLab

Ecology	Credits 2	Class
List of Practical		
1. Study of life tables and plotting of survivorship curves of different types from The hypothetical/real data provided		8
2. Determination of population density in a natural/hypothetical community by quadrat method and calculation of Shannon-Weiner diversity index for the same community		8
3. Study of an aquatic ecosystem: Phytoplankton and zooplankton, Measurement of area, temperature, determination of pH and free CO ₂		8
4. Report on a visit to National Park/Biodiversity Park/Wildlife sanctuary/Biodiversity Centre/ Any Museum		1day
Time:2Hrs	Full Marks: 20	
Examination Pattern:		
• 1 question (pH, freeCO ₂ estimation)		(8 X 1)=08
• 1 question From Item 1 and 2,		(8 X 1)=08
• Excursion Report		=02
• Laboratory Note Book		=02
Suggested Readings:		
1. Robert Desharnais, Jeffrey Bell, 'Ecology Student Lab Manual, Biology Labs'		
2. Darrell S Vodopich, 'Ecology Lab Manual'		

Suggested readings:

1. Basu, R.N. (2004). A Compendium of Terms in Ecology and Environment. Naya Udyog.
2. Begon, M., Harper, J. L. & Townsend, C.R.(2006). Ecology: Individuals, Populations&communities. 4th Ed. Blackwell science.
3. Cain, Bowman & Hacker. Ecology. 3rd edition. Sinauer associates
4. Chapman, R. L. and Reiss, M. J. (2000). Ecology- Principles& Application. Cambridge University Press.
5. Colinvaux, P. (1993). Ecology 2. John Wiley & Sons, Inc. New York.
6. Dash, M.C., (2001). Fundamental of Ecology. 2nd Ed. Tata McGraw-Hill Company.
7. Faurie, C., Ferra, C., Medori, P. & Devaux, J. (2001). Ecology-Science and Practice. Oxford & IBH Pub. Company.
8. Freedman, B. (1989). Environmental Ecology. Academic press, Inc.
9. Joshi, P.C. & Joshi, N. (2009). A Text Book of Ecology and Environment. Himalaya Publishing House.
10. Kormondy, E. J. (2002). Concepts of Ecology. 4th Indian Reprint, Pearson Education.
11. Krebs, C. J. (2001). Ecology. Benjamin Cummings.
12. Krebs, C.J. (2016). Ecology: The Experimental Analysis of Distribution and Abundance. Pearson Education Limited, Noida, India.
13. Molles, Jr. M.C.(2005). Ecology: Concepts and Applications. 3rd Ed.

- McGraw- Hill.14.Odum, E. P. & Barret, G.W. (2005).Fundamentals of Ecology. 5th Ed. Thompson Brooks/Cole.
14. Ricklefs, R. E. & Miller, G. L. (2000). Ecology. 4th Ed. W. H. Freeman & Company.
 15. Russel, P.J., Wolfe, L. S., Hertz, P.E. Starr, C. & McMillan, B. (2008). Ecology.
 16. Brooks/Cole. Saharia, V. B. (1998). Wildlife in India. Natraj Publishers.
 17. Smith, R. L. & Smith, T. M.(2001). Ecology and Field Biology. Benjamin Cummings Pearson Education.
 18. Smith, T. M & Smith, R. L. (2006). Elements of Ecology. 6th Ed. Pearson Education.
 19. Stiling, P. (2009). Ecology- Theories and Applications.4th Ed. Prentice Hall of India.
 20. Van Dyke, F. (2008). Conservation Biology: Foundations, Concepts, Application. 2nd Ed. Springer Science and Business Media.

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COURSE MODULES

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SEMESTER II

**(With effect from the session January
2018 - June 2018)**

Core T3- Non-Chordates II Course Module

Time: 2 hrs

Full Marks: 50 (40 theory + 10 internal assessment)

Lectures: 50

Questions are to be set covering the entire syllabus; 5 questions (out of eight) of 2 marks each, two questions (out of four) of 5 marks each and two questions (out of four) of 10 marks each are to be answered

Non- Chordates II	4 Credits	Class	TEACHER
Unit 1: Introduction		2	
Evolution of coelom and metamerism		1	AR
Evolution of metamerism		1	AR
Unit 2: Annelida		10	
1. General characteristics and Classification up to classes		2	SB
2. Excretion in Annelida through nephridia.		4	SB
3. Metamerism in Annelida.		4	SB
Unit 3: Arthropoda		16	
1. General characteristic and Classification up to classes		2	AR
2. Vision in Insecta only.		2	AR
3. Respiration in Arthropoda (Gills in prawn)		3	AR
4. Respiration in Arthropoda (Trachea in cockroach)		3	SB
5. Metamorphosis in Lepidopteran Insects.		3	SB
6. Social life in termite		3	SB
Unit 4: Onychophora		2	
General characteristics		1	MM
Evolutionary significance		1	MM
Unit 5: Mollusca		10	
1. General characteristics and Classification up to classes		2	AR
2. Nervous system in Gastropoda		2	AR
3. Torsion in Gastropoda		2	AR
4. Feeding in <i>Pila</i> sp		2	AR
5. Respiration in <i>Pila</i> sp		2	AR
Unit 6: Echinodermata		8	
1. General characteristics and Classification up to classes		2	SB
2. Water-vascular system in Asterozoa		2	SB
3. Larval forms in Echinodermata		2	MM
4. Affinities with Chordates		2	MM
Unit 7: Hemichordata		2	
1. General characteristics of phylum Hemichordata		1	MM
2. Relationship with non-chordates and chordates		1	MM

Suggested Readings:

1. Anderson, D. T. (Ed.) (2001). Invertebrate Zoology. 2nd Ed. Oxford University Press.
2. Barnes, R.D. & Ruppert, E. E., (1994). Invertebrate Zoology. 6th Ed. Brooks Cole.
3. Barrington, E. J. W. (1981). Invertebrate Structure and function. 2nd Ed. ELBS & Nelson.

4. Brusca, R.C. & Brusca, G. J. (2002). Invertebrates. 4th Ed. Sinauer Associates...
5. Dhama P.S and J.K. Dhama–Invertebrate Zoology–S. Chand and Co.
6. Hickman, C.P. Jr., F.M. Hickman and L.S. Roberts, 1984. Integrated Principles of Zoology, 7th Edition, Times Mirror/Mosby College Publication. St. Louis. 1065pp.
7. Hyman, L. H. (1951). The Invertebrates (Vol-I). Mc.Graw Hill Book Company.
8. Jordan, E. L. & Verma, P.S. (2006). Invertebrate Zoology. S. Chand & Company Ltd. New Delhi.
9. Kotpal, R.L., 1988 –1992. (All Series) Annelida, Arthropoda, Mollusca, Echinodermata, – Rastogi Publications, Meerut–250 002.
10. Meglitsch, P. A. & Schram, F. R. (1991). Invertebrate Zoology. Oxford University Press.
11. Parker, T. J. & Haswell, W. (1972). Text Book of Zoology, Volume I. Macmillan Press, London.
12. Pechenik, J. A. (1998). Biology of the Invertebrates, 4th Ed. McGraw Hill.
13. Ruppert E. E., Fox, R. & Barnes R.D. (2003). Invertebrate Zoology: a Functional Evolutionary Approach. 7th Ed. Brooks Cole.
14. Sinha, K. S., Adhikari, S., & Ganguly, B. B. Biology of Animals. Vol. I. New Central Book Agency (p) Ltd. Kolkata.

Note: Classification to be followed from Rupert and Barnes, 1994, 6th Edition.

Core P3–Non-Chordates II

Non-Chordates II	2 Credits	Class
List of Practical		
1. Spot identification of following specimens (based on specimen characters):		4
a. Annelids - <i>Aphrodite, Nereis, Heteronereis, Sabella, Chaetopterus, Pheretima, Hirudinaria</i>		4
b. Arthropods- <i>Carcinoscorpius, Palamnaeus, Palaemon, Daphnia, Balanus, Sacculina, Cancer, Eupagurus, Scolopendra, Julus, Bombyx, Periplaneta, Odontotermes and Apis</i>		4
c. Onychophora- <i>Peripatus</i>		1
d. Molluscs - <i>Chiton, Dentalium, Pila, Doris, Helix, Lamellidens, Ostrea, Pinctada, Sepia, Octopus, Nautilus</i>		4
e. Echinoderms- <i>Pentaceros/Asterias, Ophiura, Clypeaster, Echinus, Cucumaria and Antedon</i>		4
f. Hemichordates- <i>Balanoglossus</i>		1
2. Study of digestive system, septal nephridia and pharyngeal nephridia of earthworm using model and chart		2
3. T.S. through pharynx, gizzard, and intestine at typhlosolar region of earthworm		3
4. Mount of mouthparts and study of digestive system and nervous system of <i>Periplaneta</i> *		8
5. To submit a Project Report on any related topic on larval forms (arthropods, mollusc and echinoderm)		

Time:2Hrs		Full Marks:20	
Examination Pattern:			
Dissection (From item No. 2 and/or 4) any one	(8 ×1)	=08	
Spot identification(any four)	(2×4)	=08	
Project Report		=02	
Laboratory Note Book		=02	
Suggested Readings:			
Chatterjee and Chatterjee Practical Zoology			
Ghosh, K.C. and Manna, B. (2015): Practical Zoology, New Central Book Agency, Kolkata			
Sinha, J.K. , Chatterjee, A.K. and P. Chattopadhyay Advanced Practical Zoology			

Core T4- Cell Biology Course Module

Time: 2 hrs

Full Marks: 50 (40 theory + 10 internal assessment)

Lectures: 50

Questions are to be set covering the entire syllabus; 5 questions (out of eight) of 2 marks each, two questions (out of four) of 5 marks each and two questions (out of four) of 10 marks each are to be answered

Cell Biology	Credits4	Class	TEACHER
Unit 1: Overview of Cells		2	
Basic structure of Prokaryotic and Eukaryotic cells		1	MM
Basic structure of Viruses, Viroid, Prion and Mycoplasma		1	MM
Unit 2: Plasma Membrane		6	
1. Ultra structure and composition of Plasma membrane: Fluid mosaic model		2	SB
2. Transport across membrane: Active and Passive transport, Facilitated transport		2	SB
3. Cell junctions: Tight junctions, Gap junctions, Desmosomes		2	SB
Unit 3: Cytoplasmic organelles I		5	
1. Structure and Functions: Endoplasmic Reticulum		2	SB
1. Structure and Functions: Golgi Apparatus		1	SB
1. Structure and Functions: Lysosomes		1	SB
2. Protein sorting and mechanisms of vesicular transport		1	SB
Unit 4: Cytoplasmic organelles II		6	
1. Mitochondria: Structure, Semi-autonomous nature		1	MM
1. Mitochondria: Endosymbiotic hypothesis.		1	MM
2. Mitochondria: Mitochondrial Respiratory Chain		1	MM
3. Mitochondria: Chemiosmotic hypothesis.		1	MM
4. Structure and Functions of Peroxisome		1	MM
5. Structure and Functions of Centrosome		1	MM
Unit 5: Cytoskeleton		5	
1. Type, structure and functions of cytoskeleton		2	AR
2. Accessory proteins of microfilament & microtubule		2	AR
3. A brief idea about molecular motors		1	AR
Unit 6: Nucleus		8	
1. Structure of Nucleus: Nuclear envelope, nuclear pore complex, Nucleolus		2	SB
2. Structure of Nucleus: Nucleolus.		2	SB
3. Chromatin: Euchromatin and Heterochromatin		2	SB
4. Chromatin: Packaging of chromatin (nucleosome)		2	SB
Unit 7: Cell Division		10	
1. Cell cycle: Definition, types, and models		1	MM

2. Cell cycle regulation	1	MM
2. Cancer (Concept of oncogenes with special reference to and Ras and APC.	2	MM
2. Cancer (Concept of tumor suppressor genes with special reference to p53, Retinoblastoma	2	MM
3. Mitosis: Basic process and their significance	2	MM
3. Meiosis: Basic process and their significance	2	MM
Unit8:Cell Signalling	8	
1. Cell signaling transduction pathways: Definitions, types	1	SB
2. Types of signaling molecules and receptors	1	SB
3. GPCR and Role of second messenger (cAMP)	2	SB
4. Extracellular matrix	2	SB
5. Cell interactions Apoptosis and Necrosis	2	SB

Suggested Readings:

1. Albert Bruce, Bray Dennis, Levis Julian, Raff Martin, Roberts Keithand Watson James (2008). Molecular Biology of the Cell, V Edition, Garland publishing Inc., New YorkandLondon.
2. Cooper, G.M. and Hausman, R.E. (2009). The Cell: A Molecular Approach. 5thEdition. ASM Press and Sunderland, Washington, D.C.; Sinauer Associates, MA.
3. Hardin, J. Bertoni, Gand Kleinsmith, J.L. (2012). Becker'sWorldoftheCell.8thEdn,Pearson Benjamin Cummings, San Francisco.
4. Harvey, L. (2004). Molecular Cell Biology. 5th Edn. W.H. Freeman
5. Karp, G.(2008).Celland Molecular biology: Concepts and Application. 5thEdn, JohnWiley.
6. Lodish, Berk, Matsudaira, Kaiser, Bretscher, Ploegh, Amon, and Martin (2016) Molecular Cell Biology. 8th Edn. W.H. Freeman
7. Pal, A. (2011). Textbookof Cell and Molecular Biology 3rd Edn, Books and Allied, Kolkata.
8. Plopper, G,D. Sharp, Siroski, E (2015) Lewin's Cell 3rd Edition—Johns & Bartlett Publishers
9. Pollard and Earnshaw (2007). Cell Biology. 2nd. Edn Saunders.
10. Reed, J.C. and Green, D.R.(2011).Apoptosis: Physiology and Pathology. Cambridge Univ. Press
11. Verma and Agarwal. Cell Biology, Genetics, Molecular Biology, Evolution and Ecology. S.Chand Pub, Weinberg R.A.(2014). Biology of Cancer. 2nd edition. Garland Science, Taylor and Francis

CoreP4–Cell Biology Lab

Cell Biology	2 Credits	Class	Teacher
List of Practical			
1. Preparation of temporary stained squash of onion root tip to study various stages of mitosis			MM
2. Squash preparation of grasshopper testis and study of the various stages of meiosis.			AR
3. Preparation of permanent slide to show the presence of Barr body in human female blood cells/cheek cells.			SB
4. Study of cell viability by Trypan Blue staining from onion root tip/ blood cell.			SB
Time:2Hrs		Full Marks: 20	
Examination Pattern: 1 question on squash preparation from Item No. 1 or 2 -----(6X 1) = 06 Preparation of slide(From Item 3or 4) -----(4X 1)= 04 Identification of stages of mitosis and meiosis (2X4) = 08 Laboratory Note Book----- = 02			
Suggested Readings: Chatterjee and Chatterjee Practical Zoology Ghosh, K.C. and Manna, B. (2015): Practical Zoology, New Central Book Agency, Kolkata Sinha, J.K. , Chatterjee, A.K. and P. Chattopadhyay Advanced Practical Zoology			

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COURSE IN ZOOLOGY (HONS)
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CREDIT SYSTEM (CBCS)**

SEMESTER III

**(With effect from the session July
2018 - December 2018)**

3.9 Core T5- Chordates Course Module

Time: 2 hrs

Full Marks: 50 (40 theory + 10 internal assessment)

Lectures: 50

Questions are to be set covering the entire syllabus; 5 questions (out of eight) of 2 marks each, two questions (out of four) of 5 marks each and two questions (out of four) of 10 marks each are to be answered

Chordates	4 Credits	Class	TEACHER
Unit 1: Introduction to Chordates		2	
General characteristics		1	AR
Outline classification of Phylum Chordata		1	AR
Unit 2: Protochordata		6	
General characteristics and Classification of sub-phylum Urochordata up to Classes		1	SB
General characteristics and Classification of sub-phylum Cephalochordate up to Classes		1	SB
Retrogressive metamorphosis in Ascidia.		2	SB
Chordate Features in <i>Branchiostoma</i>		1	SB
Feeding in <i>Branchiostoma</i>		1	SB
Unit 3: Origin of Chordata		2	
Dipleurula concept and the Echinoderm theory of origin of chordates		1	MM
Advanced features of vertebrates over Protochordata		1	MM
Unit 4: Agnatha		2	
General characteristics of cyclostomes		1	MM
Classification of cyclostomes up to order		1	MM
Unit 5: Pisces		6	
General characteristics and classification of Chondrichthyes up to Subclasses		1	AR
General characteristics and classification of Osteichthyes up to Subclasses		1	AR
Accessory respiratory organ of fishes		1	MM
Fish migration		1	MM
Parental caring in fishes		1	AR
Swim bladder in fishes.		1	AR
Unit 6: Amphibia		6	
General characteristics and classification upto living Orders		2	SB
Metamorphosis in Amphibia		2	SB
Parental care in Amphibia		2	SB
Unit 7: Reptilia		8	
General characteristics and classification up to living Orders		2	MM
Poison apparatus in Snake		3	MM
Biting mechanism in Snake		3	MM
Unit 8: Aves		8	
General characteristics and classification up to Sub-Classes		1	AR
Exoskeleton in Birds		2	AR
Migration in Birds		2	AR
Principles and aerodynamics off flight		3	AR
Unit 9: Mammals		8	
General characters and classification up to living orders		1	SB
Affinities of Prototheria		1	SB
Exoskeleton derivatives of mammals		2	SB
Adaptive radiation in mammals with reference to locomotory appendages		2	MM
Echolocation in Micro-chiropterans		1	MM
Echolocation in Cetaceans		1	MM
Unit 10: Zoogeography		2	
Zoogeographical realms, plate tectonic and Continental drift theory		1	SB
Distribution of Birds and Mammals in different realms		1	SB

Suggested Readings:

1. Arora, M.P. *Chordata I. Himalaya Pub House*
2. Darlington P.J. *The Geographical Distribution of Animals*, R.E. Krieger Pub Co.
3. Hall B.K. and Hallgrimsson B.(2008). *Strickberger's Evolution*. IV Edition. Jones and Bartlett
4. Jordan, E.L. & Verma, P.S. (2003). *Chordate Zoology*. S. Chand & Company Ltd. New Delhi.
5. Kardong, K.V. (2002). *Vertebrates: Comparative anatomy, function evolution*. Tata McGraw Hill.
6. Kent, G. C. & Carr, R.K. (2001). *Comparative anatomy of the Vertebrates*. 9th Ed. McGrawHill.
7. Nelson, J.S. (2006): *Fishes of the World*, 4th Edn. Wiley.
8. Parker, T.J. & Haswell, W. (1972). *Text Book of Zoology, Volume II: Marshall and Willam (Eds.)* 7th Ed. Macmillan Press, London.
9. Pough H. Christine M. J. and B. Haiser (2002). *Vertebrate life*, VIII Edition, Pearson Internatl.
10. Rastogi, V.B. *Ecology and Animal Distribution*. Rastogi Publication.
11. Romer, A. S. & Parsons, T.S. (1986). *The vertebrate body*. 6th Ed. Saunders College Pub.
12. Sinha, K. S, Adhikari, S. Ganguly B.B. & Bharati Goswami, B.D. (2001). *Biology of Animals*. Vol. II. New Central Book Agency (p) Ltd.
13. Young, J. Z. (2004). *The Life of Vertebrates*. III Edition. Oxford university press.
14. Note: Classifications for Protochordata, Agnatha, Reptilia, Aves and Mammalia to be followed from Young (1981), for Pisces to be followed from Romer (1959), for Amphibia to be followed from Duellman and Trueb (1986).

3.10. CoreP5–Chordates Lab

Chordates	2 Credits		Class	Teacher
List of Practical				
1. Spot identification of:				
a. Protochordata : <i>Balanoglossus, Herdmania, Branchiostoma</i>				AR
b. Agnatha: <i>Petromyzon, Myxine</i>				SB
c. Fishes: <i>Scoliodon, Sphyrna, Pristis, Torpedo, Chimaera, Mystus, Heteropneustes, Labeo, Catla, Cirrhinus, Hypophthalmichthys, Cyprinus, Ctenopharyngodon, Exocoetus, Echineis, Anguilla, Hippocampus, Tetradon/Diodon, Anabas, Clarias</i>				SB
d. Amphibia: <i>Necturus, Bufo, Hyla, Alytes, Axolotl larva, Tylostotriton</i>				MM
e. Reptilia: <i>Chelone, Trionyx, Hemidactylus, Varanus, Uromastix, Mabuya, Draco, Bungarus, Vipera, Naja, Hydrophis</i>				MM
f. Mammalia: Bat (Insectivorous and Frugivorous), <i>Funambulus</i>				MM
2. Key for Identification of poisonous and non-poisonous snake				
3. Mounting of Pecten from Fowl head				
4. Dissection of brain and pituitary of any major carp				
5. Power point presentation on study of any two animals from two different classes by students				
Time: 2Hrs		Full Marks: 20		
Examination Pattern:				
One question on Dissection (Item No. 4)----- (6X 1) = 06				
One question (From Item 2 or 3) ----- (4 X 1) = 04				
Spot Identification of Four Specimen (2X3) = 06				
Power point Presentation = 02				
Laboratory Note Book ----- = 02				
Suggested Readings:				
1. Chatterjee and Chatterjee Practical Zoology				
2. Ghosh, K.C. and Manna, B. (2015): Practical Zoology, New Central Book Agency, Kolkata				
3. Sinha, J.K. , Chatterjee, A.K. and P. Chattopadhyay Advanced Practical Zoology				

3.11 Core T6- Animal Physiology: Controlling & Coordinating Systems Course Module

Time: 2 hrs

Full Marks: 50 (40 theory + 10 internal assessment)

Lectures: 50

Questions are to be set covering the entire syllabus; 5 questions (out of eight) of 2 marks each, two questions (out of four) of 5 marks each and two questions (out of four) of 10 marks each are to be answered

Animal Physiology: Controlling & Coordinating Systems	4 Credits	Class	TEACHER
Unit 1: Tissues		4	
Structure, location, classification and functions of epithelial tissue		1	MM
Structure, location, classification and functions of connective tissue		1	MM
Structure, location, classification and functions of muscular tissue		1	MM
Structure, location, classification and functions of nervous tissue		1	MM
Unit 2: Bone and Cartilage		4	
Structure and types of bones		1	AR
Structure and types of cartilages		1	AR
Ossification		2	AR
Unit 3: Nervous System		10	
Structure of neuron, resting membrane potential		1	SB
Origin of action potential		2	SB
Propagation of action potential across the myelinated nerve fibers		2	SB
Propagation of action potential across the unmyelinated nerve fibers.		2	SB
Types of synapse, Synaptic transmission and Neuro-muscular junction;		2	SB
Reflex action and its types		1	SB
Unit 4: Muscular system		10	
Histology of different types of muscle		3	AR
Ultra structure of skeletal muscle		2	AR
Molecular and chemical basis of muscle contraction		3	SB
Characteristics of muscle fibre		2	AR
Unit 5: Reproductive System		6	
Histology of testis		2	MM
Histology of ovary		2	MM
Physiology of Reproduction		2	MM
Unit 6: Endocrine System		16	
Histology and function of pituitary		2	AR
Histology and function of thyroid		2	AR
Histology and function of pancreas		2	AR
Histology and function of adrenal		2	AR
Classification of hormones		1	AR
Mechanism of Hormone action: Signal transduction pathways for Steroidal hormones		2	SB
Mechanism of Hormone action: Signal transduction pathways for Non-steroidal hormones		2	SB
Hypothalamus(neuro-endocrine gland)-principal nuclei involved in neuro-endocrine control of anterior pituitary and endocrine system		2	SB
Placental hormones		1	SB

Suggested Readings:

1. Cui, Naftel, Daley, Lynch, Haines, Yang and Fratkun (2011). Atlas of Histology with Functional and Clinical Correlations. Lippincott, Williams and Wilkins.
2. Cormack, D.H (2003). PDQ Histology. B.C. Decker Ins., London
3. Gartner and Hiatt (2011). Concise Histology. Saunders Elsevier
4. Gunasegaran, JP (2010). A Text book of Histology and a Practical Guide. Elsevier
5. Junquera and Cameiro (2005). Basic Histology: Text and Atlas.
6. Ross & Pawlina Histology: A Text and Atlas. Sixth Edition. Lippincott Williams & Wilkins.

7. Randall, D. and Warren Burggren. Eckert Animal Physiology 4th edition. W.H. Freeman.
 8. Sembulingam and Sembulingam (2012) Essentials of Medical Physiology. 6th Edn. Jaypee Pub, New Delhi
 9. Vasudeva and Mishra (2014). Inderbir Singh's Text book Of Human Histology 7th Edn Jaypee Publisher N. Delhi.

3.12. CoreP6– Animal Physiology: Controlling & Coordinating Systems

Animal Physiology: Controlling & Coordinating Systems	2 Credits		Class	Teacher
List of Practical				
1. Recording of simple muscle twitch with electrical stimulation(or Virtual)				AR
2. Demonstration of the unconditioned reflex action(Deep tendon reflex such as knee jerk reflex)				AR
3. Preparation of temporary mounts: Squamous epithelium, Striated muscle fibres				SB
4. Identification of permanent slides of Mammalian Cartilage, Bone, Pituitary, Liver, Kidney, Intestine, Lung, Pancreas, Testis, Ovary, Adrenal, Thyroid				SB
5. Microtomy: Preparation of permanent slide of any five mammalian(Goat/white rat)tissues				MM
Time:2Hrs		Full Marks: 20		
Examination Pattern:				
Preparation of stained temporary mount (Item No. 3) -----			(6×1) = 06	
One question (From Item 1, 2 or 5) -----			(6×1) = 06	
Spot Identification of Four Specimen			(2×3) = 06	
Laboratory Note Book -----			= 02	
Suggested Readings:				
Scudamore C.L. (2014). A Practical Guide to the Histology of Mouse. Wiley Blackwell.				

3.13 Core T7- Fundamentals of Biochemistry Course Module

Time: 2 hrs

Full Marks: 50 (40 theory + 10 internal assessment)

Lectures: 50

Questions are to be set covering the entire syllabus; 5 questions (out of eight) of 2 marks each, two questions (out of four) of 5 marks each and two questions (out of four) of 10 marks each are to be answered

Fundamentals of Biochemistry	4 Credits	Class	TEACHER
Unit 1: Carbohydrates		8	
Structure and Biological importance: Monosaccharides, Disaccharides, Polysaccharides; Derivatives of Monosaccharides		2	SB
Carbohydrate metabolism: Glycolysis		2	SB
Carbohydrate metabolism: Citric acid cycle		2	SB
Carbohydrate metabolism: Pentose phosphate pathway		1	SB
Carbohydrate metabolism: Gluconeogenesis		1	SB
Unit 2: Lipids		7	
Structure and Significance: Physiologically important saturated and unsaturated fatty acids, Tri- acyl glycerols, Phospholipids, Sphingolipid, Glycolipids		2	SB
Structure and Significance: Physiologically important saturated and unsaturated fatty acids, Steroids, Eicosanoids and terpenoids.		1	SB
Lipid metabolism: β -oxidation of fatty acids		2	SB
Fatty acid biosynthesis		2	SB
Unit 3: Proteins		10	
Amino acids : Structure, Classification, Physiological importance of essential and non-essential amino acids		1	AR
General and Electrochemical properties of α -amino acids		2	AR
Bonds stabilizing protein structure; Protein: Levels of organization		2	AR
Protein metabolism: Transamination, Deamination,		2	AR
Urea cycle		2	AR
Fate of C-skeleton of Glucogenic and Ketogenic amino acids		1	AR
Unit 4: Nucleic acids		10	
Structure: Purines and pyrimidines, Nucleosides, Nucleotides,		1	MM
Structure: Nucleic acids (DNA)		3	MM
Structure: Nucleic acids (RNA)		2	MM
Types of DNA and RNA, Complementarity of DNA		1	MM
Hypo-Hyper chromaticity of DNA		1	MM
Basic concept of nucleotide metabolism		2	MM
Unit 5: Enzymes		6	
Nomenclature and classification; Cofactors; Specificity of enzyme action; Isozymes		1	MM
Mechanism of enzyme action		1	MM
Enzyme kinetics; Derivation of Michaelis- Menten Equation,		1	MM
Lineweaver-Burk plot; Factors affecting rate of enzyme- catalyzed reactions		1	MM
Enzyme inhibition; Allosteric enzymes		1	MM
Strategy of enzyme action: Catalytic and Regulatory (Basic concept with one example each)		1	MM
Unit 6: Oxidative Phosphorylation		2	
Redox systems; Review of mitochondrial respiratory chain		1	SB
Inhibitors and un-couplers of Electron		1	SB

Suggested Readings:

1. Berg, J.M., Tymoczko, J.L. and Stryer, L (2007). Biochemistry, VI Edition, W.H. Freeman and Co., New York.
2. Campbell and Farrell (2012). Biochemistry. 7th Edn. Brooks and Cole.
3. Chatterjee, MN and Shinde, R (2012). A Textbook of Medical Biochemistry. 8th Edn. Jaypee Pub., N. Delhi

4. Cox, M.M and Nelson, D.L. (2008). Lehninger's Principles of Biochemistry, V Edition, W.H. Freeman and Co. New York.
5. Das, D. (200). Biochemistry. Central Book Agency, Kolkata
6. Hames, B.D. and Hooper, N.M. (2000). Instant Notes in Biochemistry, II Edition, BIOS Scientific Publishers Ltd., U.K.
7. Jain, J.L., Jain m S and N. Jain. Fundamentals of Biochemistry. S. Chand Pub. N. Delhi
8. Maheswari, N (2008). Clinical Biochemistry. Jaypee Pub., New Delhi
9. Metzler D.E. (2001). The chemical reactions of living cells –2nd edition, 2001, Academic Press.
10. Murray, R.K. ,Bender , D.A., Botham, K.M., Kennelly ,P.J., Rodwell, V.W. and Well, P.A. (2009).Harper's Illustrated Biochemistry, XXVIII Edition, International Edition, The McGraw-Hill Companies Inc.
11. Sathyanarayana U. and Chakrapani, (2002). Biochemistry –Books & Allied (P) Ltd, Kolkata
12. Voet. D & Voet. J.G, (2004). Biochemistry –3rd edition, 2004, John Wiley & Sons, Inc.
13. Zubay G.L, (1998). Biochemistry –4th edition, Mc Graw-Hill.

CoreP7– Fundamentals of Biochemistry Lab

Fundamentals of Biochemistry	2 Credits		Class	Teacher
List of Practical				
1. Qualitative tests of functional groups in a) carbohydrates (Benedict's test) b) proteins (Biuret's test) and c) lipids (Saponification number)			SB	
2. Paper chromatography of amino acids.			SB	
3. Quantitative estimation of protein by Lowry Method			AR	
4. Demonstration of protein separation by SDS-PAGE.			MM	
5. To study the enzymatic activity of a) Salivary amylase and b) Catalase in <i>Cajanus cajan</i> .			SB	
Time: 2Hrs		Full Marks: 20		
Examination Pattern:				
One question on Qualitative test (Item No. 1 & 5) ----- (6X 1) = 06				
One question on quantitative test (From Item 3) ----- (8X 1) = 08				
One question from item no. 2 & 4 (4X1) = 04				
Laboratory Note Book ----- = 02				
Suggested Readings:				
?				

5.1 SEC T1- Sericulture Course Module

Time: 2 hrs

Full Marks: (40 theory + 10 internal assessment)

Lectures: 25

Questions are to be set covering the entire syllabus; 5 questions (out of eight) of 2 marks each, two questions (out of four) of 5 marks each and two questions (out of four) of 10 marks each are to be answered

Sericulture	2 Credits	Class	TEACHER
Unit 1: Introduction		2	
Sericulture: Definition, history and present status, Silk route		1	MM
Types of Silkworms, Distribution and Races. Exotic and indigenous races Mulberry and non-mulberry Sericulture		1	MM
Unit 2: Biology of Silkworm		4	
Life cycle of <i>Bombyx mori</i>		2	SB
Structure of silk gland and secretion of silk		2	SB
Unit 3: Rearing of Silk worms		10	
Selection of mulberry variety and establishment of mulberry garden		1	AB
Rearing house and rearing appliances. Disinfectants: Formalin, bleaching powder, RKO		2	SB
Silkworm rearing technology: Early age and Late age rearing		3	AB
Types of mount ages		2	SB
Spinning, harvesting and storage of cocoons		2	SB
Unit 4: Pests and Diseases		7	
Pests of silkworm :Uzify, dermestid beetles and vertebrates		2	MM
Pathogenesis of silkworm diseases: Protozoan, viral, fungal and bacterial		2	MM
Control and prevention of pests and diseases		3	SB
Unit 5: Entrepreneurship in Sericulture		2	
Prospectus of Sericulture in India: Sericulture industry in different states, employment, potential in mulberry and non-mulberry sericulture		1	MM
Visit to various sericulture centers.		1	MM

Reference Books

1. Manual on Sericulture; Food and Agriculture Organisation, Rome 1976
2. Handbook of Practical Sericulture: S.R. Ullal and M.N. Narasimhanna CSB, Bangalore
3. Silkworm Rearing and Disease of Silkworm, 1956, Ptd. By Director of Ptg., Stn. & Pub. Govt. Press, Bangalore
4. Appropriate Sericultural Techniques; Ed. M. S. Jolly, Director, CSR & TI, Mysore.

THE UNIVERSITY OF BURDWAN



COURSE MODULES

**FOR THREE-YEAR DEGREE
COURSE IN ZOOLOGY (HONS)
UNDER CHOICE BASED
CREDIT SYSTEM (CBCS)**

SEMESTER IV

**(With effect from the session January
2022 - June 2022)**

Core T8-Comparative Anatomy of Vertebrates

Time: 2 hrs

Full Marks: 50 (40 theories + 10 internal assessment)

Lectures: 50

Questions are to be set covering the entire syllabus; 5 questions (out of eight) of 2 marks each, two questions (out of four) of 5 marks each and two questions (out of four) of 10 marks each are to be answered

Comparative Anatomy of Vertebrates	4 Credits	Class	TEACHER
Unit 1: Integumentary System		6	
Structure, function and derivatives of integument in amphibian		2	SB
Structure, function and derivatives of integument in birds		2	SB
Structure, function and derivatives of integument in mammals		2	SB
Unit 2: Skeletal System		6	
Overview of axial and appendicular skeleton		2	SB
Jaw suspension		2	MM
Visceral arches		2	MM
Unit 3: Digestive System		8	
Comparative anatomy of stomach		4	AR
Dentition in mammals		4	AR
Unit 4: Respiratory System		6	
Respiratory organs in fish		2	MM
Respiratory organs in amphibian		1	MM
Respiratory organs in birds		2	AR
Respiratory organs in mammals		1	AR
Unit 5: Circulatory System		8	
General plan of circulation		2	MM
Comparative account of heart		3	MM
Comparative account of aortic arches		3	MM
Unit 6: Urinogenital System		6	
Succession of kidney		2	SB
Evolution of urinogenital ducts		2	SB
Types of mammalian uteri		2	SB
Unit 7: Nervous System		6	
Comparative account of brain		3	MM
Cranial nerves in mammals		3	MM
Unit 8: Sense Organs		4	
Classification of receptors		1	SB
Brief account of auditory receptors invertebrate		3	SB

Suggestive Readings

1. Hilderbrand, Mand Gaslow G.E. Analysis of Vertebrate Structure, John Wiley and Sons
2. Kardong, K.V. (2005) Vertebrates' Comparative Anatomy, Function and Evolution. IV Edition. McGraw-Hill Higher Education
3. Kent, G.C. and Carr R.K. (2000). Comparative Anatomy of the Vertebrates. IX Edition. McGraw-Hill Companies
4. Saxena, R.K. & Saxena, S.C. (2008): Comparative Anatomy of Vertebrates, Viva Books Pvt. Ltd.

Core T8-Comparative Anatomy of Vertebrates

Comparative Anatomy of Vertebrates	2 Credits	Class	TEACHER
List of Practical			
1. Study of placoid, cycloid and ctenoid scales through permanent slides /photographs			AR
2. Study of disarticulated skeleton of Toad, Pigeon and Guineapig			MM
3. Demonstration of Carapace and plastron of turtle from model/chart			SB
4. Identification of mammalian skulls: One herbivorous(Guineapig) and one carnivorous animal (Dog)			MM
5. Study and Dissection of Afferent arterial system, brain, pituitary in Carp			AR
Full Marks: 20			
Examination Pattern:			
One question on Dissection (Item No. 5)	-----	(8X1) =	08
One question (From Item No. 1)	-----	(4 X 1) =	04
Spot Identification of Four Specimen (from item 2,3,and 4)		(1.5X4) =	06
Laboratory Note Book -----			= 02

Core T9- Animal Physiology: Life Sustaining Systems

Time: 2 hrs

Full Marks: 50 (40 theory + 10 internal assessment)

Lectures: 50

Questions are to be set covering the entire syllabus; 5 questions (out of eight) of 2 marks each, two questions (out of four) of 5 marks each and two questions (out of four) of 10 marks each are to be answered

Animal Physiology: Life Sustaining Systems	4 Credits	Class	TEACHER
Unit 1: Physiology of Digestion		12	
Structural organization and functions of Gastrointestinal tract and Associated glands		2	SB
Mechanical digestion of food		2	SB
Chemical digestion of food		2	SB
Absorption of Carbohydrates		1	SB
Absorption of Lipids		1	SB
Absorption of Proteins		1	MM
Absorption of Nucleic Acids		1	MM
Digestive enzymes		2	MM
Unit 2: Physiology of Respiration		10	
Mechanism of Respiration		1	SB
Respiratory volumes and capacities		1	SB
Transport of Oxygen in blood		2	SB
Transport of Carbon dioxide in blood		2	SB
Dissociation curves and the factors influencing it		2	AR
Respiratory pigments		1	AR
Carbon monoxide poisoning		1	AR
Unit 3: Physiology of Circulation		12	
Components of Blood and their functions		1	SB
Structure and functions of haemoglobin		1	SB
Homeostasis (Definition, different pathways, components etc.)		2	SB
Blood clotting system (Intrinsic pathway)		2	SB
Blood clotting system (Extrinsic pathway)		2	SB
Fibrinolytic system		1	MM
Haemopoiesis; Basic steps and its regulation		2	MM
Blood groups; ABO and Rh factor		1	MM
Unit 4: Physiology of Heart		8	
Structure of mammalian heart		2	AR
Coronary Circulation		1	AR
Structure and working of conducting myocardial fibres		2	AR
Origin and conduction of cardiac impulses		1	SB
Cardiac Cycle and cardiac output		1	SB
Blood pressure and its regulation		1	SB
Unit 5: Thermoregulation & Osmoregulation		10	
Physiological classification based on thermal biology		2	MM
Thermal biology of endotherms		3	MM
Osmoregulation in aquatic vertebrates		3	MM
External osmoregulatory organs invertebrates		2	MM

Unit 6: Renal Physiology	8	
Structure of Kidney and its functional unit	2	SB
Mechanism of urine formation	3	MM
Regulation of acid-base balance	3	SB

Suggested Readings:

1. Costanzo, L.S. BRS Physiology. 4th Edn. Lippincott Williams and Wilkins.
1. Fox, S.I. (2011). Human Physiology. 12th Edn. Mc Graw Hill.
2. Gunstream, S.E. (2010). Anatomy and Physiology with integrated study guide. 4th Edn., Mc Graw Hill
3. Guyton, A.C. & Hall, J.E. (2006). Textbook of Medical Physiology. XI Edn. Harcourt Asia PTE Ltd. W.B. Saunders Company.
4. Hill, Wyese and Anderson (2012). Animal Physiology. 3rd Edn. Sinauer Associates.
5. Randall, Burggren and French Eckert Animal Physiology: Mechanisms and adaptations
6. Rastogi, S.C. (2007). Essentials of Animal Physiology 4th Edn. New Age Pub., N. Delhi
7. Sembulingam and Sembulingam (2012) Essentials of Medical Physiology. 6th Edn. Jaypee Pub, New Delhi
8. Sherwood, L. (2013). Human Physiology from cells to systems. 8th Edn., Brooks & Cole
9. Tortora, G.J. & Grabowski, S. (2006). Principles of Anatomy & Physiology. XI Edition John Wiley & sons,
10. Victor P. Eroschenko. (2008). DiFiore's Atlas of Histology with Functional correlations. XII Edition. Lippincott W. & Wilkins.
11. Vander A, Sherman J. and Luciano D. (2014). Vander's Human Physiology: The Mechanism of Body Function. XIII Edition, McGraw Hills

Core P9–Animal Physiology: Life Sustaining Systems Lab

Animal Physiology: Life Sustaining Systems	2 Credits	Class	TEACHER
List of Practical			
1. Determination of ABO Blood group			SB
2. Enumeration of red blood cells and white blood cells using haemocytometer			MM
3. Estimation of haemoglobin using Sahli's haemoglobinometer			AR
4. Preparation of haemin crystals			MM
5. Recording of blood pressure using a sphygmomanometer			AR
Full Marks: 20			
Examination Pattern:			
One Experiment from Item No. 3 or 4	-----	(6X 1) =	06
One Experiment from Item No. 2	-----	(7X 1) =	07
One experiment from Item No. 1 or 5		(1 X5) =	05
Laboratory Note Book -----			= 02

Core T10-Immunology

Time: 2 hrs

Full Marks: 50 (40 theory + 10 internal assessment)

Lectures: 50

Questions are to be set covering the entire syllabus; 5 questions (out of eight) of 2 marks each, two questions (out of four) of 5 marks each and two questions (out of four) of 10 marks each are to be answered

Immunology	4 Credits	Class	TEACHER
Unit 1: Overview of Immune System		2	
Basic concepts of health and diseases, Historical perspective of Immunology		1	MM
Cells and organs of the Immune system		1	MM
Unit 2: Innate and Adaptive Immunity		8	
Anatomical barriers		1	SB
Inflammation		1	SB
Cell and molecules involved in innate immunity		2	SB
Cell and molecules involved in Adaptive immunity (Cell mediated)		2	SB
Cell and molecules involved in Adaptive immunity (Humoral)		2	SB
Unit 3: Antigens		4	
Antigenicity and immunogenicity, Immunogens, Adjuvants and haptens		1	AR
Factors influencing immunogenicity		2	AR
Band T-Cell epitopes		1	AR
Unit 4: Immunoglobulins		8	
Structure and functions of different classes of immunoglobulins		2	MM
Antigen- antibody interactions		2	MM
Immunoassays (ELISA and RIA)		2	MM
Hybridoma technology, Monoclonal antibody production		2	MM
Unit 5: Major Histocompatibility Complex		6	
Structure and functions of MHC molecules		2	SB
Structure of T cell Receptor and its signaling		2	SB
T cell development & selection		2	SB
Unit 6: Cytokines		2	
Types, properties and functions of cytokines		2	AR
Unit 7: Complement System		6	
Components of complement system		3	SB
Pathways of complement activation		3	SB
Unit 8: Hypersensitivity		4	
Gell and Coombs' classification		1	AB
Brief description of various types of hypersensitivities		3	AB
Unit 9: Immunology of diseases		6	
Malaria		1	SB
Filariasis		1	SB
Dengue		2	SB
Tuberculosis		2	SB
Unit 10: Vaccines		4	
Various types of vaccines		1	AR
Active immunization (Artificial and natural)		2	SB
Passive immunization (Artificial and natural)		1	SB

Suggested Readings:

1. Abbas, K. Abul and Lechtman H. Andrew (2003.) Cellular and Molecular Immunology. V Edition. Saunders Publication.
2. Abbas, K. Abul and Lechtman H. Andrew (2011.) Basic Immunology: Functions and Disorders of Immune System. Saunders Elsevier Publication.
3. Delves, Martin, Burton and Roitt (2006). Roitt's Essential Immunology. 11th Edn. Blackwell Pub.
4. Kindt, T.J., Goldsby, R.A., Osborne, B.A. and Kuby, J (2006). Immunology, VI Edition. W.H.Freeman and Company.
5. Mohanty, SK and Leela, KS (2014). Text book of Immunology. 2nd Edn. Jaypee Pub. N. Delhi
6. Parija, SC (2012). Text book of Microbiology and Immunology. 2nd Edn. Elsevier.
7. Playfair, JHL and Chain, BM (2001) Immunology at a glance. 7 th Edn. Blackwell Pub.
8. Shetty, N. (2005). Immunology: Introductory Textbook. 2nd Edn. , New Age Internatl. Pub. N. Delhi
9. Virella, G (2007). Medical Immunology 6th Edn. Informa Healthcare.

Core P10–Immunology Lab

Immunology	2 Credits	Class	TEACHER
List of Practical			
1. Demonstration of lymphoid organs in human through model/ photograph.			SB
2. Histological study of spleen, thymus and lymph nodes through slides/photographs			AR
3. Preparation of stained blood film to study various types of blood cells.			MM
4. Total count (TC) & Differential count (DC) of WBC			SB
5. Demonstration of ELISA by available teaching kit			SB
Full Marks: 20			
Examination Pattern:			
One Experiment from Item No. 3 or 4 -----	(10X1) = 10		
Identification of slides/ photographs(Two)	(2 X4) = 08		
Laboratory Note Book -----	= 02		

SEC T2- Aquarium Fish Keeping

Time: 2 hrs

Full Marks: (40 theory + 10 internal assessment)

Lectures: 25

Questions are to be set covering the entire syllabus; 5 questions (out of eight) of 2 marks each, two questions (out of four) of 5 marks each and two questions (out of four) of 10 marks each are to be answered

Aquarium Fish Keeping	2 Credits	Class	TEACHER
Unit 1: Introduction to Aquarium Fish Keeping		2	
The potential scope of Aquarium Fish Industry as a Cottage Industry, Exotic and Endemic species of Aquarium Fishes			AR
Unit 2: Biology of Aquarium Fishes		10	
Common characters and sexual dimorphism of Freshwater and Marine Aquarium fishes such as Guppy, Molly, Swordtail, Goldfish, Angel fish, Bluemorph, Anemone fish and Butterfly fish			AR
Unit 3: Food and feeding of Aquarium fishes		7	
Use of live fish feed organisms		2	SB
Preparation and composition of formulated fish feeds,		3	SB
Aquarium fish as larval predator		2	MM
Unit 4: Fish Transportation		3	
Live fish transport- Fish handling, packing and forwarding techniques.			MM
Unit 5: Maintenance of Aquarium		3	
General Aquarium maintenance – budget for setting up an Aquarium Fish Farm as a Cottage Industry			MM

Suggested Readings:

1. Axelrod, H.R. (1967). Breeding aquarium Fishes. TFH Pub.
2. Jayashree, K.V. Thara Devi, C.S. & Arumugam, N. Home Aquarium & Ornamental fish Culture. Saras Pub.
3. Mahapatra, B.K. (2015). Ornamental Fish Breeding, Culture & Trade. CIFE